

REMARKS

The Applicants respectfully request that the Examiner reconsider the rejection of the present application in view of the foregoing amendments and the following remarks.

Information Disclosure Statement

An Information Disclosure Statement was filed on February 1, 2007, a day after the non-final action was mailed. Accordingly, pursuant to 37 CFR 1.97(c) the Applicants are submitting the fee under 37 CFR 1.17(p) in order to have the Information Disclosure Statement considered by the Examiner.

35 USC 101: Claims 1 to 9

The Examiner rejected Claims 1-9 under 35 USC 101. In making the rejection the Examiner asserted that those claims are directed to non-statutory subject matter. More specifically, the Examiner explained that the claims fail to set forth a useful, concrete, and tangible result of the claimed method. The Examiner further explained that for the results of the claimed method to be tangible, they would have to be output to a user, as by displaying or storing the results. Applicants traverse this rejection for the following reasons.

The Examiner concedes that the claims are directed to useful and concrete subject matter, but then objects that they do not claim a tangible result. As justification for the objection, the Examiner refers to the OG Notice from 22 November 2005 titled "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility", and in particular to the section IV-C-2-b of that Notice. In particular subsection (2) of section IV-C-2-b relates to the issue of "tangible result". However, the Examiner appears to have overlooked that cited section of the guidelines applies to claimed inventions that are abstract ideas, laws of nature, or natural phenomena. See, for example, the title to section IV-C-2.

Claim 1 is as originally presented is not directed to an abstract idea, a law of nature, or a natural phenomenon. Rather it is directed to a method of generating an optically sectioned image

of a specimen, a tangible and useful result. The Applicants' claimed method includes physical objects and physical phenomena (a specimen, an illumination pattern, acquired signals) and requires the operations of illuminating, imaging, acquisition, and measurement. It is not at all clear from the Examiner's comments how the Applicants' claimed method could be construed as an abstract idea, a law of nature, or a natural phenomenon.

Notwithstanding the foregoing remarks, in order to advance the prosecution of this application, Claim 1 has been amended to include the step of "generating an optically sectioned image of the specimen by combining the measured characteristics in their relative positions". It is believed that Claim 1 now sets forth a tangible result under the guidelines and thus, is directed to eligible subject matter. Therefore, the rejection of Claims 1-9 under 35 USC 101 should be withdrawn.

35 USC 102(b): Claims 1, 3-14, and 17-19

The Examiner rejected claims 1, 3-14, and 17-19 under 35 USC 102(b) as being anticipated by US 4,794,550 (Greivenkamp). In making the rejection the Examiner stated, relative to Claim 1:

Regarding Claim 1, Greivenkamp teaches illuminating the specimen with a temporally modulating, spatially periodic illumination pattern (column 1, lines 21-24 and lines 34-38); imaging said specimen on a conjugate image plane (column 1, lines 24-29); acquiring a plurality of signals at respective positions on said image plane (column 2, lines 3-9), each signal corresponding to the incident light intensity at that position and having an oscillatory component caused by the modulation of the illumination pattern (column 2, lines 22-27); and measuring a characteristic of the oscillatory component of each of the signals, whereby the measured characteristics when combined in their relative positions generate an optically sectioned image of the specimen (column 2, lines 3-9).

The Applicants traverse this rejection for the following reasons.

The Examiner appears to have overlooked the fact that the independent claims, Claims 1, 10, 11, and 19 are all directed to the generation of an optically sectioned image. Greivenkamp,

on the other hand, describes Moiré techniques to obtain surface contour measurements. For example, Greivenkamp at column 1, lines 5 to 7, states: "This invention relates to the field of surface contour measurement, and more particularly to Moiré contouring techniques." At column 1, lines 13 to 18, Greivenkamp describes, "There are two basic implementations of this technique: Moiré topography and Moiré deflectometry. Moiré topography is used to measure surfaces that are diffuse reflectors. Moiré deflectometry is used with surfaces that are specular reflectors." Further, at column 7, lines 13 to 18, of Greivenkamp it is stated, "In one example of the present invention, the a priori knowledge is that the surface contour is smooth, therefore having continuous derivatives, and the location of a neighborhood on the surface where the contour changes by less than $C/2$ per sample. In another example, the a priori knowledge of the surface is the location and height of a step discontinuity to within less than C ."

It is clear from the foregoing excerpts that Greivenkamp describes the use of Moiré topography and deflectometry techniques to measure surface contour where surface height changes of the specimen are relatively small compared to the fringe spacing. The measurement of surface contour is a very different process from generating an optically sectioned image of a specimen. The difference between the results of the two processes is illustrated graphically below. The process described in Greivenkamp measures the surface topography of a specimen as illustrated in the graphic on the left. In contrast, the Applicants' claimed process generates an optical image of a section of the specimen, as illustrated in the graphic on the right.



Moreover, the Examiner has misinterpreted the disclosure of Greivenkamp. More specifically, at column 1, lines 21-24 and lines 34-38, there is no description of a temporally modulating illumination pattern. Indeed, equation (1) at column 1, line 32, has no time variable. The intensity varies only with position, denoted by the space variables x and y .

Further, although Greivenkamp describes at column 2, lines 3-9, that the fringe pattern (10) is sampled by an image sensor (17), column 2, lines 22-27 does not describe sampling a time-varying signal. The fringe displacement referred to at column 2, line 23 is a linear displacement caused by the surface contouring. It is not caused by temporal modulation of the fringe pattern. Further, Greivenkamp at column 2, lines 3-9, does not describe measuring a characteristic of an oscillatory component of the fringe pattern, that is one caused by temporal modulation of the pattern. The pattern described in Greivenkamp has no time varying component.

It should now be apparent that Greivenkamp does not describe a process that has all of the steps of the Applicants' claimed process as set forth in Claim 1 or Claim 10. Nor does Greivenkamp describe an imaging device that has all of the features of the Applicants' claimed imaging apparatus as set forth in Claims 11 and 19. It follows from the foregoing remarks that Claims 1, 10, 11 and 19 are novel relative to Greivenkamp.

Claims 2-9 depend from Claim 1 either directly or indirectly, and thus, are novel relative to Greivenkamp for at least the same reasons as Claim 1. Claims 12-18 depend from Claim 11 either directly or indirectly, and thus, are novel relative to Greivenkamp for at least the same reasons as Claim 11.

Accordingly, the Applicants request that the rejection of the claims under Section 102(b) be withdrawn.

35 USC 103(a): Claim 2

The Examiner rejected Claim 2 under 35 USC 103(a) as being unpatentable over Greivenkamp as applied to Claim 1, and further in view of US 4,584,484 (Hutchin). In explaining the rejection, the Examiner asserted that Greivenkamp describes the features of Claim 2 except for the requirement that the measured characteristic of the oscillatory component of the signals is the amplitude. The Examiner further asserted that Hutchin describes measuring the amplitude of the oscillatory component. The Applicants traverse this rejection.

In support of the rejection, the Examiner cites the text at column 1, line 67, to column 2, line 8, of Hutchin. That text reads as follows.

The recorded data is thereafter processed by extracting phase and amplitude values of at least some of the fourier [sic] components of the recorded signals (which contain information equivalent to the fourier [sic] components of the image of the physical specimen measured at high resolution) and the fourier [sic] transformation is thereafter carried out for producing data which may be employed in reconstructing an optical image of the sample or scene under examination.

The text relied on by the Examiner does not support the rejection. The cited text refers to the amplitude of a Fourier component. Fourier components vary as a function of frequency, not temporally. Therefore, the portion of Hutchin relied on by the Examiner is irrelevant to the subject matter of Greivenkamp and to the Applicant's claimed invention as set forth in Claim 2. It should also be noted that the technique described in Hutchin is so different from that described in Greivenkamp that motivation to combine the teachings of the two references is not readily apparent. The Examiner has not explained why a person skilled in the art would try to use the technique described in Hutchin in the system described in Greivenkamp.

Further, as discussed above relative to Claims 1, 10, 11, and 19, Greivenkamp does not describe an illuminating pattern that is time varying (temporally modulated). Nor does Greivenkamp describe or suggest generating an optical image of a section of a specimen as set

forth for the Applicants' claimed method and apparatus. Hutchin neither describes nor suggests either of those features. Therefore, even if the system described in Hutchin could somehow be combined with that described in Greivenkamp, the proposed combination would not have all of the features of the Applicants' claimed method as set forth in Claim 2.

For all of these reasons, the proposed combination of Hutchin with Greivenkamp, fails to raise a *prima facie* case of unpatentability. Accordingly, the rejection of Claim 2 should be withdrawn.

35 USC 103(a): Claims 15 and 16

The Examiner rejected Claims 15 and 16 under 35 USC 103(a) as being unpatentable over Greivenkamp as applied to Claim 11, and further in view of US 5,598,265 (de Groot). The Examiner asserted that Greivenkamp describes the features of Claim 15 except for the requirement that the acquisition means comprises an array of light detectors for detecting the light intensities at the plurality of image plane positions. The Examiner also asserted that de Groot describes an array of light detectors for detecting the light intensities at the plurality of image plane positions at column 9, lines 14-23. The Examiner then concludes that it would have been obvious to combine the features of de Groot with the system described in Greivenkamp to arrive at the Applicants' claimed invention. The Examiner further asserts that Greivenkamp teaches a two-dimensional array of light detectors and apparently concludes that it would have been obvious to include such a feature in the Applicants' claimed apparatus as set forth in Claim 16. The Applicants traverse the rejection of Claims 15 and 16 for the following reasons.

De Groot describes another technique for imaging and analysis of the surface of an object. In particular, de Groot relates to a technique for profiling the surface of an object. As discussed above relative to Claims 1, 10, 11, and 19, Greivenkamp does not describe an illuminating pattern that is time varying (temporally modulated). Nor does Greivenkamp describe or suggest generating an optical image of a section of a specimen as set forth for the Applicants' claimed

method and apparatus. De Groot neither describes nor suggests those features. Therefore, even if the system described in de Groot could somehow be combined with that described in Greivenkamp, the proposed combination would not have all of the features of the Applicants' claimed method as set forth in Claim 15 or Claim 16.

For all of these reasons, the proposed combination of de Groot with Greivenkamp, fails to raise a *prima facie* case of unpatentability. Accordingly, the rejection of Claims 15 and 16 should be withdrawn.

The New Claims

The Applicants are submitting new Claims 20-25 with this response. It is believed that the new claims do not include any new matter. Written support for the additional feature set forth in new Claim 20 is found at page 6, line 34 to page 7, line 2 of the Specification. Written support for the feature set forth in new Claims 21 and 23 is found at page 11, lines 29 to 32, of the Specification.

Written support for the feature set forth in new Claims 22 and 24 is found at page 12, lines 10-16, and in Figure 3 which shows the frequency response of a detector/processor pair. The description, discussing Figure 3, states that the response provides an AC signal pass band. The width of the pass band from the drawing figure is about 50 kHz to about 1 MHz. Evidently, therefore, the detector/processor pair is not a lock-in type of detector (i.e., there is no synchronization of the modulation frequency of the illumination pattern and signal filtering), because detection and processing is possible across a range of modulation frequencies. Additional support for the feature set forth in new Claims 22 and 24 is at page 7, lines 10 to 13, which states that the processor is adapted to filter the acquired signals at substantially the same frequency as the modulation frequency.

Written support for the additional feature of Claim 25 is found in original Claim 2 which

sets forth the same feature.

CONCLUSION

In view of the foregoing amendments and remarks, it is believed that the claims of this application are in condition for allowance. Therefore, the Applicants respectfully request entry of the amendments and reconsideration of the rejections set forth in the Official Action.

Respectfully submitted,

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